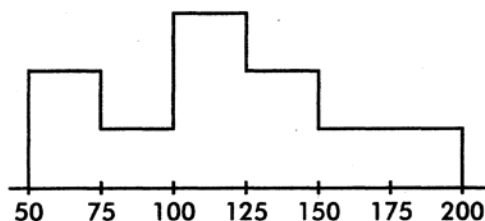


## Final Review Multiple Choice Problems #4

1. Following is a histogram of home sale prices (in thousands of dollars) in one community:



Which of the following statements are true?

- I. The median price was \$125,000.
  - II. More homes sold for between \$100,000 and \$125,000 than for over \$125,000.
  - III. \$10,000 is a reasonable estimate of the standard deviation in selling prices.
- (A) I only  
(B) II only  
(C) III only  
(D) All are true.  
(E) None is true.
2. Which of the following can stemplots show?
- I. Symmetry
  - II. Gaps
  - III. Clusters
  - IV. Outliers
- (A) I, II, and III  
(B) I, II, and IV  
(C) I, III, and IV  
(D) II, III, and IV  
(E) I, II, III, and IV

3. The average yearly snowfall in a city is 55 inches. What is the standard deviation if 15% of the years have snowfalls above 60 inches? Assume yearly snowfalls are normally distributed.
- (A) 4.83  
(B) 5.18  
(C) 6.04  
(D) 8.93  
(E) The standard deviation cannot be computed from the information given.
4. To determine the average cost of running for a congressional seat, a random sample of 50 politicians are chosen and their records are examined. If the cost figures show a mean of \$125,000 with a standard deviation of \$32,000, what is the 90% confidence interval estimate for the average cost of running for office?
- (A)  $\$125,000 \pm \$1053$   
(B)  $\$125,000 \pm \$7444$   
(C)  $\$125,000 \pm \$8870$   
(D)  $\$125,000 \pm \$32,000$   
(E)  $\$125,000 \pm \$52,640$

5. In one study on the effect that eating meat products has on weight level, 500 subjects who admitted to eating meat at least once a day had their weights compared with those of 500 people who claimed to be vegetarians. In a second study, 500 randomly chosen subjects were served at least one meat meal per day for 6 months, while 500 others were randomly chosen to receive a strictly vegetarian diet for 6 months, with weights compared after 6 months.

- (A) The first study is a controlled experiment, while the second is an observational study.  
 (B) The first study is an observational study, while the second is a controlled experiment.  
 (C) Both studies are controlled experiments.  
 (D) Both studies are observational studies.  
 (E) Each study is part controlled experiment and part observational study.

6. A plumbing contractor obtains 60% of her boiler circulators from a company whose defect rate is 0.005, and the rest from a company whose defect rate is 0.010. What proportion of the circulators can be expected to be defective? If a circulator is defective, what is the probability that it came from the first company?

- (A) .0070, .429  
 (B) .0070, .600  
 (C) .0075, .500  
 (D) .0075, .600  
 (E) .0150, .571

7. A patient claims that he consumes only 2000 calories per day, but a dietician suspects that the actual figure is higher. The dietician plans to check his food intake for 30 days and will reject the patient's claim if the 30-day mean is more than 2100 calories. If the standard deviation (in calories per day) is 350, what is the probability that the dietician will mistakenly reject a patient's true claim?

- (A) .03  
 (B) .06  
 (C) .12  
 (D) .28  
 (E) .44

8. In the following table, what value for  $n$  results in a table showing perfect independence?

40	60
50	$n$

- (A) 30  
 (B) 50  
 (C) 70  
 (D) 75  
 (E) 100

9. When a random sample of 25 jars of peanut butter labeled "18 ounces" are weighed, the mean is 17.94 ounces with a standard deviation of 0.13 ounce. What is the 99% confidence interval estimate for the mean weight?

- (A)  $17.94 \pm 0.015$  ounces  
 (B)  $17.94 \pm 0.026$  ounces  
 (C)  $17.94 \pm 0.065$  ounces  
 (D)  $17.94 \pm 0.067$  ounces  
 (E)  $17.94 \pm 0.073$  ounces

10. Given the probabilities  $P(A) = .3$  and  $P(B) = .2$ , what is the probability of the union  $P(A \cup B)$  if  $A$  and  $B$  are mutually exclusive? If  $A$  and  $B$  are independent? If  $B$  is a subset of  $A$ ?

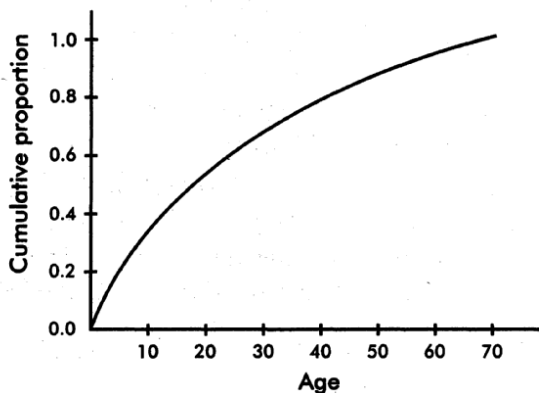
- (A) .44, .5, .2  
 (B) .44, .5, .3  
 (C) .5, .44, .2  
 (D) .5, .44, .3  
 (E) 0, .5, .3

11. A nursery owner claims that a recent drought stunted the growth of 22% of all her evergreens. A botanist tests this claim by examining 1100 trees. In which of the following intervals is the  $P$ -value located if 268 evergreens in the sample show signs of stunted growth?

- (A)  $P < .01$   
 (B)  $.01 < P < .025$   
 (C)  $.025 < P < .05$   
 (D)  $.05 < P < .10$   
 (E)  $P > .10$

12. A medical research team tests for tumor reduction in a sample of patients using three different dosages of an experimental cancer drug. Which of the following is true?
- (A) There are three explanatory variables and one response variable.
  - (B) There is one explanatory variable with three levels of response.
  - (C) Tumor reduction is the only explanatory variable, but there are three response variables corresponding to the different dosages.
  - (D) There are three levels of a single explanatory variable.
  - (E) Each explanatory level has an associated level of response.

For Questions 13 and 14 consider the following: The graph below shows cumulative proportion plotted against age for a population.



13. The median is approximately what age?
- (A) 17
  - (B) 30
  - (C) 35
  - (D) 40
  - (E) 45

14. The interquartile range is approximately how many years?

- (A) 7
- (B) 17
- (C) 28
- (D) 35
- (E) 70

15. In a random sample of 300 high school students, 225 said they managed time effectively, while in a similar sample of 270 college students, only 108 felt they were effective time managers. What is a 99% confidence interval estimate for the difference between the proportions of high school and college students who think they manage time effectively?

- (A)  $.35 \pm .004$
- (B)  $.35 \pm .090$
- (C)  $.35 \pm .100$
- (D)  $.35 \pm .138$
- (E)  $.35 \pm .163$

16. Which of the following are true statements?

- I. The histogram of a binomial distribution with  $p = .5$  is always symmetric no matter what  $n$ , the number of trials, is.
- II. The histogram of a binomial distribution with  $p = .17$  is skewed to the right.
- III. The histogram of a binomial distribution with  $p = .83$  is almost symmetric if  $n$  is very large.

- (A) I and II
- (B) I and III
- (C) II and III
- (D) I, II, and III
- (E) None of the above answers gives the complete set of true responses.

17. A pet food manufacturer runs an experiment to determine whether three brands of dog food are equally preferred by dogs. In the experiment, 150 dogs are individually presented with three dishes of food, each containing a different brand, and their choices are noted. Tabulations show that 62 dogs go to brand A, 43 to brand B, and 45 to brand C. Is there sufficient evidence to say that dogs have preferences among the brands? Test at the 10% significance level.
- (A) No, with  $\chi^2 = 2.09$ , there is not sufficient evidence even at the 25% significance level.
  - (B) No, with  $\chi^2 = 4.36$ , there is not sufficient evidence at the 10% level.
  - (C) No, with  $\chi^2 = 19.0$ , there is not sufficient evidence even at the 0.1% level.
  - (D) Yes, with  $\chi^2 = 4.36$ , there is sufficient evidence at the 10% level.
  - (E) Yes, with  $\chi^2 = 19.0$ , there is sufficient evidence even at the 0.1% level.
18. A talk show host recently reported that in response to his on-air question, 82% of the more than 2500 e-mail messages received through his publicized address supported the death penalty for anyone convicted of selling drugs to children. What does this show?
- (A) The survey is meaningless because of voluntary response bias.
  - (B) No meaningful conclusion is possible without knowing something more about the characteristics of his listeners.
  - (C) The survey would have been more meaningful if he had picked a random sample of the 2500 listeners who responded.
  - (D) The survey would have been more meaningful if he had used a control group.
  - (E) This was a legitimate sample, randomly drawn from his listeners, and of sufficient size to be able to conclude that most of his listeners support the death penalty for such a crime.
19. A test is run to determine whether there is a difference in miles per gallon between two car models. A random sample of 40 autos of the first model and 50 of the second model are available for the test. What is the probability of mistakenly claiming there is a difference when there isn't if the cutoff difference scores are  $\pm 0.5$ ? Assume standard deviations of 1.2 and 0.65 miles per gallon, respectively, for the two models.
- (A) .0045
  - (B) .0089
  - (C) .0178
  - (D) .4911
  - (E) .9822
20. Suppose  $X$  and  $Y$  are random variables with  $E(X) = 37$ ,  $\text{var}(X) = 5$ ,  $E(Y) = 62$ , and  $\text{var}(Y) = 12$ . What are the expected value and variance of the random variable  $X + Y$ ?
- (A)  $E(X + Y) = 99$ ,  $\text{var}(X + Y) = 8.5$
  - (B)  $E(X + Y) = 99$ ,  $\text{var}(X + Y) = 13$
  - (C)  $E(X + Y) = 99$ ,  $\text{var}(X + Y) = 17$
  - (D)  $E(X + Y) = 49.5$ ,  $\text{var}(X + Y) = 17$
  - (E) There is insufficient information to answer this question.
21. Which of the following can affect the value of the correlation coefficient  $r$ ?
- (A) A change in measurement units
  - (B) A change in which variable is called  $x$  and which is called  $y$
  - (C) Adding the same constant to all values of the  $x$ -variable
  - (D) All of the above can affect the  $r$  value.
  - (E) None of the above can affect the  $r$  value.
22. The American Medical Association (AMA) wishes to determine the percentage of obstetricians who are considering leaving the profession because of the rapidly increasing number of lawsuits against obstetricians. How large a sample should be taken to find the answer to within  $\pm 3\%$  at the 95% confidence level?
- (A) 6
  - (B) 33
  - (C) 534
  - (D) 752
  - (E) 1068

23. Following are parts of the probability distributions for the random variables  $X$  and  $Y$ .

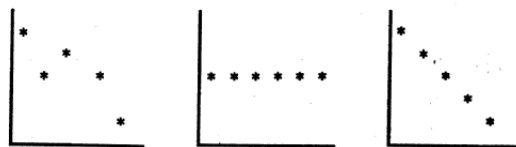
$x$	$P(x)$	$y$	$P(y)$
1	.25	1	.3
2	?	2	.5
3	.35	3	?
4	?		

If  $X$  and  $Y$  are independent and the joint probability  $P(X = 2, Y = 3) = .03$ , what is  $P(X = 4)$ ?

- (A) .10  
(B) .15  
(C) .20  
(D) .25  
(E) .30
24. Which of the following sets has the smallest standard deviation? Which has the largest?
- I. 1, 2, 3, 4, 5, 6, 7  
II. 1, 1, 1, 4, 7, 7, 7  
III. 1, 4, 4, 4, 4, 4, 7
- (A) I, II  
(B) II, III  
(C) III, I  
(D) II, I  
(E) III, II
25. A researcher plans a study to examine long-term confidence in the U.S. economy among the adult population. She obtains a simple random sample of 30 adults as they leave a Wall Street office building one weekday afternoon. All but two of the adults agree to participate in the survey. Which of the following are true statements?
- I. Proper use of chance as evidenced by the simple random sample makes this a well-designed survey.  
II. The high response rate makes this a well-designed survey.  
III. Selection bias makes this a poorly designed survey.
- (A) I only  
(B) II only  
(C) III only  
(D) I and II  
(E) None of the statements is true.

26. Suppose that the regression line for a set of data,  $y = 5x + b$ , passes through the point (3, 4). If  $\bar{x}$  and  $\bar{y}$  are the sample means of the  $x$ - and  $y$ -values, respectively, then  $\bar{y} =$

- (A)  $\bar{x}$ .  
(B)  $\bar{x} - 3$ .  
(C)  $\bar{x} + 4$ .  
(D)  $5\bar{x}$ .  
(E)  $5\bar{x} - 11$ .
27. Consider the following three scatterplots:



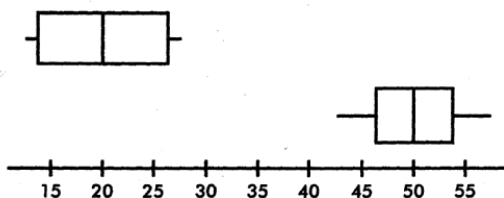
What is the relationship among  $r_1$ ,  $r_2$ , and  $r_3$ , the correlations associated with the first, second, and third scatterplots, respectively?

- (A)  $r_1 < r_2 < r_3$   
(B)  $r_1 < r_3 < r_2$   
(C)  $r_2 < r_3 < r_1$   
(D)  $r_3 < r_1 < r_2$   
(E)  $r_3 < r_2 < r_1$
28. There are two games involving flipping a coin. In the first game you win a prize if you can throw between 45% and 55% heads. In the second game you win if you can throw more than 80% heads. For each game would you rather flip the coin 30 times or 300 times?
- (A) 30 times for each game  
(B) 300 times for each game  
(C) 30 times for the first game and 300 times for the second  
(D) 300 times for the first game and 30 times for the second  
(E) The outcomes of the games do not depend on the number of flips.

29. City planners are trying to decide among various parking plan options ranging from more on-street spaces to multilevel facilities to spread-out small lots. Before making a decision, they wish to test the downtown merchants' claim that shoppers park for an average of only 47 minutes in the downtown area. The planners have decided to tabulate parking durations for 225 shoppers and to reject the merchants' claim if the sample mean exceeds 50 minutes. If the merchants' claim is wrong and the true mean is 51 minutes, what is the probability that the random sample will lead to a mistaken failure to reject the merchants' claim? Assume that the standard deviation in parking durations is 27 minutes.

(A) .0475  
(B) .2123  
(C) .2877  
(D) .7123  
(E) .9525

30. Consider the following parallel boxplots indicating the starting salaries (in thousands of dollars) for blue collar and white collar workers at a particular production plant:



Which of the following are true statements?

- I. The ranges are the same.  
II. The interquartile ranges are the same.  
III. Because of symmetry, their medians are the same.

(A) I only  
(B) II only  
(C) I and II  
(D) I and III  
(E) II and III

31. The mean Law School Aptitude Test (LSAT) score for applicants to a particular law school is 650 with a standard deviation of 45. Suppose that only applicants with scores above 700 are considered. What percentage of the applicants considered have scores below 740? (Assume the scores are normally distributed.)

(A) 13.3%  
(B) 17.1%  
(C) 82.9%  
(D) 86.7%  
(E) 97.7%

32. A magazine article states that teenagers watch 2 hours of television per day. A sociologist who believes the true figure is higher interviews 18 teenagers and calculates a mean of 2.8 hours with a variance of 1.334. In what interval is the  $P$ -value found?

(A)  $P < .0025$   
(B)  $.0025 < P < .005$   
(C)  $.005 < P < .01$   
(D)  $.01 < P < .05$   
(E)  $.05 < P$

33. A researcher planning a survey of school principals in a particular state has lists of the school principals employed in each of the 125 school districts. The procedure is to obtain a random sample of principals from each of the districts rather than grouping all the lists together and obtaining a sample from the entire group. Which of the following statements about the resulting stratified sample are true?

- I. It is not a simple random sample.  
II. It is easier and less costly to obtain than a simple random sample.  
III. It gives comparative information that a simple random sample wouldn't give.

(A) I only  
(B) I and II  
(C) I and III  
(D) II and III  
(E) I, II, and III

34. A surprising study of 1437 male hospital admissions reported in *The New York Times* (February 24, 1993, page C12) found that, of 665 patients admitted with heart attacks, 214 had vertex baldness, while of the remaining 772 non-heart-related admissions, 175 had vertex baldness. Is this evidence sufficient at the 5% significance level to say that there is a relationship between heart attacks and vertex baldness?
- (A) Yes, because  $\chi^2 = 4.05$ , while the critical  $\chi^2$  is 3.84.
  - (B) Yes, because  $\chi^2 = 16.39$ , while the critical  $\chi^2$  is 3.84.
  - (C) No, because  $\chi^2 = 16.39$ , while the critical  $\chi^2$  is 3.84.
  - (D) No, because  $\chi^2 = 4.05$ , while the critical  $\chi^2$  is 7.81.
  - (E) Yes, because  $\chi^2 = 16.39$ , while the critical  $\chi^2$  is 7.81.
35. Changing from a 90% confidence interval estimate to a 99% confidence interval estimate, with all other things being equal,
- (A) increases the interval size by 9%.
  - (B) decreases the interval size by 9%.
  - (C) increases the interval size by 57%.
  - (D) decreases the interval size by 57%.
  - (E) This question cannot be answered without knowing the sample size.